

The sarcophagid flies from Peninsular Malaysia (Diptera: Sarcophagidae)

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Abstract: The collections of Malayan Sarcophagidae preserved in the National Science Museum and the National Institute of Infectious Diseases, Tokyo and made by the present authors during the field surveys in the Peninsular Malaysia between 2004 and 2008 are dealt with. A total of two subfamilies, 20 genera and 45 species is listed. A new species, *Boettcherisca highlandica* sp. nov. is described and illustrated.

Key words: Sarcophagidae, *Boettcherisca*, Peninsular Malaysia, new species, new record

INTRODUCTION

The present study is a partial result solely from Peninsular Malaysia of the collaborate project of "Study on taxonomy and molecular biology of forensically important flies in Malaysia". The research was carried out in various habitats such as primary forests, farms, mangrove swamps and beaches including some parts of national parks. The researchers obtained the necessary permits from the Department of Wildlife and National Parks, Peninsular Malaysia and Johor National Parks Corporation to conduct research on Diptera (Two-winged flies) for taxonomic and molecular biology studies.

During the field survey in our project, the authors tried to collect flies in different localities and various habitats in order to make a comprehensive series of samples for molecular analysis. The collected samples were mounted with insect pins in good order. All specimens were sorted into families. Most samples were grouped into so called higher Diptera such as the subfamilies Miltogramminae and Sarcophaginae. We also had an opportunity to examine a good series of Malayan sarcophagid collections which were preserved in the National Science Museum, Tokyo (NSMT), the National Institute of Infectious Diseases, Tokyo (NIID) and the International Department of Dipterology, Tokyo (IDD). There were very few sarcophagid specimens available in Malayan local collections which were made by Mr. Heo Chong Chin, National University of Malaysia (PCHCC). Totally, we have examined two subfamilies, 20 genera and 45 species.

Among 45 species of Malaysian Sarcophagidae, we found one undescribed species which has never been recorded from other areas than the Peninsular Malaysia and it should be included in the genus *Boettcherisca*.

In the present paper we describe this new species with illustration of male genitalia and report the species examined and identified. Identified specimens are mostly deposited in the Department of Genetics, University of Malaya (UM) and Sarawak Museum (SM as Natural History Reference Collection), Kuching. Some were shared and deposited in

the National Science Museum, Tokyo as indicated in [] in the list of species below. In this paper, genera and species are listed alphabetically under the higher taxa according to their subfamily. New country records are indicated with an asterisk(*).

Family SARCOPHAGIDAE
Subfamily Miltogramminae

***Amobia pelopei* (Rondani, 1859)**

Sphixapata pelopei Rondani, 1859: 228. Type locality: Parma, Italy.

Material examined. 1 ♀, Bukit Mandul, 20 km W. KL, 1.xi.1975, H. Shima (NSMT); 1 ♀, Cameron Highland, 700–1,800 m, 27.x.1975, S. Shinonaga (NSMT); 1 ♀, Negeri Sembilan State, Port Dickson District, Port Dickson, nr swamp, 8.v.2008, S. H. Tan (UM).

***Amobia quatei* Kurahashi, 1974**

Amobia quatei Kurahashi, 1974: 58. Type locality: Dalat, Vietnam.

Material examined. 1 ♂, Ulogombach rd., 30 km E. K. L., 30.x.1975, S. Shinonaga (NIID).

***Macronychia malayana* Kurahashi and Pape, 1996**

Macronychia malayana Kurahashi and Pape, 1996: 268. Type locality: Gunung Jasar, Cameron Highlands, Pahang, Malaysia.

Material examined. 2 ♂PT, Pahang, Cameron Highlands, Gunung Jasar, 15–27.xi.1994, T. Pape (NIID).

***Metopia argyrocephala* (Meigen, 1824)**

Tachina argyrocephala Meigen, 1824: 372. Type locality: Europe [probably Germany].

Material examined. 3 ♂, Tapah Dist., 50 km from Tanah Rata, 1.v.2008, H. Kurahashi (IDD); 7 ♂, Lubok Merbau, nr Kuala Kansar, 100 m, 17.iii.1990, H. Kurahashi (NSMT).

***Metopia sauteri* (Townsend, 1932)**

Chaetanicia sauteri Townsend, 1933: 446. Type locality: Hengchun (Gangkou) [“Koshun (Kankau)”].

Material examined. 1 ♂, Cameron Highlands Dist., Brinchang, Mt. Berembun, 1.v.2008, H. Kurahashi (IDD).

***Metopia suifenhoensis* Fan, 1965**

Metopia (s. str.) *suifenhoensis* Fan, 1965: 300. Type locality: Suifenhe, Heilongjiang, China. Material examined. 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT).

***Protomiltogramma parafacialis* Kurahashi and Leh, 2008**

Protomiltogramma parafacialis Kurahashi and Leh, 2008: 4. Type locality: Pa Ukat, Bario, Miri Division, Sarawak State, Malaysia.

Material examined. 1 ♂, Taman Negara, K. Tahan, 60 m, 22–26.iv.1979, H. Kurahashi (NSMT).

***Senotainia navigatrix* (Meijere, 1910)**

Macronychia navigatrix Meijere, 1910: 111. Type locality: Lang I., Krakatau, Sumatra, Indonesia.

Material examined. 1 ♂, Ulogombach rd., 30 km E. K. L., 30.x.1975, S. Shinonaga (NIID); 1 ♂, Tapah Dist., 50 km from Tanah Rata, 1.v.2008, H. Kurahashi (IDD); 1 ♂, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 1 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD).

Subfamily Sarcophaginae

***Alisarcophaga gressitti* (Hall and Bohart, 1948)**

Sarcophaga gressitti Hall and Bohart, 1948: 131. Type locality: Point Ritidan, Guam.

Material examined. 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 9 ♂, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 15 ♂, Negeri Sembilan State, Port Dickson District, Port Dickson, nr sandy beach, 8.v.2008, S. H. Tan (UM).

***Boettcherisca highlandica* sp. nov.**

DESCRIPTION. Male. — **Head:** dichoptic; frons index 0.16–0.18 ($M=0.17$, $n=10$); frontal stripe black; parafacial yellowish-grey pollinose; antenna blackish, 3rd segment 2.5 x as long as 2nd; gena black, grey pollinose, with numerous black hairs, ca. 1/5 of height of eye (HE); postgena with numerous yellowish white hairs; *ori* 14, lower 4 divergent; first and second rows of postocular/postorbital setae regular, but other rows irregular. Palpus black, slender, with black bristles and hairs.

Thorax: black, grey to brownish grey pollinose, with 3 black longitudinal stripes on scutum; propleuron hairy; prosternum hairy on posterior 2/3; mesothoracic spiracle blackish. Chaetotaxy: *ac* 0+1; *dc* 5+5; *ia* 1+2, presutural one fine; *h* 3; *ph* 2, *prs* 1; *sa* 3; *n* 4, sometimes with 1 fine interstitials between 3rd and 4th *n*; *pa* 2; *sc* 3+1; *st* 1+1+1.

Wings: hyaline, slightly brownish-tinged along veins; epaulet blackish; basicosta creamy white; vein R1 bare; vein R_{4+5} with row of 14 short setulae extending 1/2 way from basal node to r-m above; several (4–5) setulae present on node of veins R_{2+3} and R_{4+5} below; CS_3 slightly longer than CS_5 ; CS_5 with short spines along anterior margin on basal 2/5. Alar and thoracic squamae both fuscous brown on disc, alar squama with tuft of fuscous brown hairs on inner lower margin; thoracic squama with fuscous brown hairs on outer lower margin. Halter blackish brown.

Legs: black; fore femur with 2 rows of long *pd*, row of long *pv*; fore tibia with 2 short *ad* basally, 1 *p* at apical 1/3; mid femur with numerous long hairs on basal 2/3 of posteroventral surface, 4–5 strong *a* present along median longitudinal line, 2 *p-pd* apically, row of rather strong *av* basally, rows of short *av* and *pv* apically; mid tibia with 1 submedian *ad*, 2 long *pd*, 1 *p* and 1 *v* present at apical 1/3; hind femur with 2 rows of *ad*, row of *av*, and 2 *p-pd* apically, numerous short hairs present on antero- and posteroventral surfaces; hind tibia with 2–3 *ad*, 2–3 *pd*, 1 *av* at apical 1/3, and 1 strong submedian *av*, short fringe poorly developed on apical 2/3 of posteroventral surface.

Abdomen: black, greyish pollinose on tergites 1+2–5, tessellate, more or less brownish or dull golden tinges on tergites 4–5; tergite 3 without marginal bristle; tergite 4 with median and 3 lateral marginal bristles; tergite 5 with row of marginal bristles; sternite 5 of Y-shape; GS_1 fuscous black, slightly yellowish-grey pollinose, without marginal bristle;

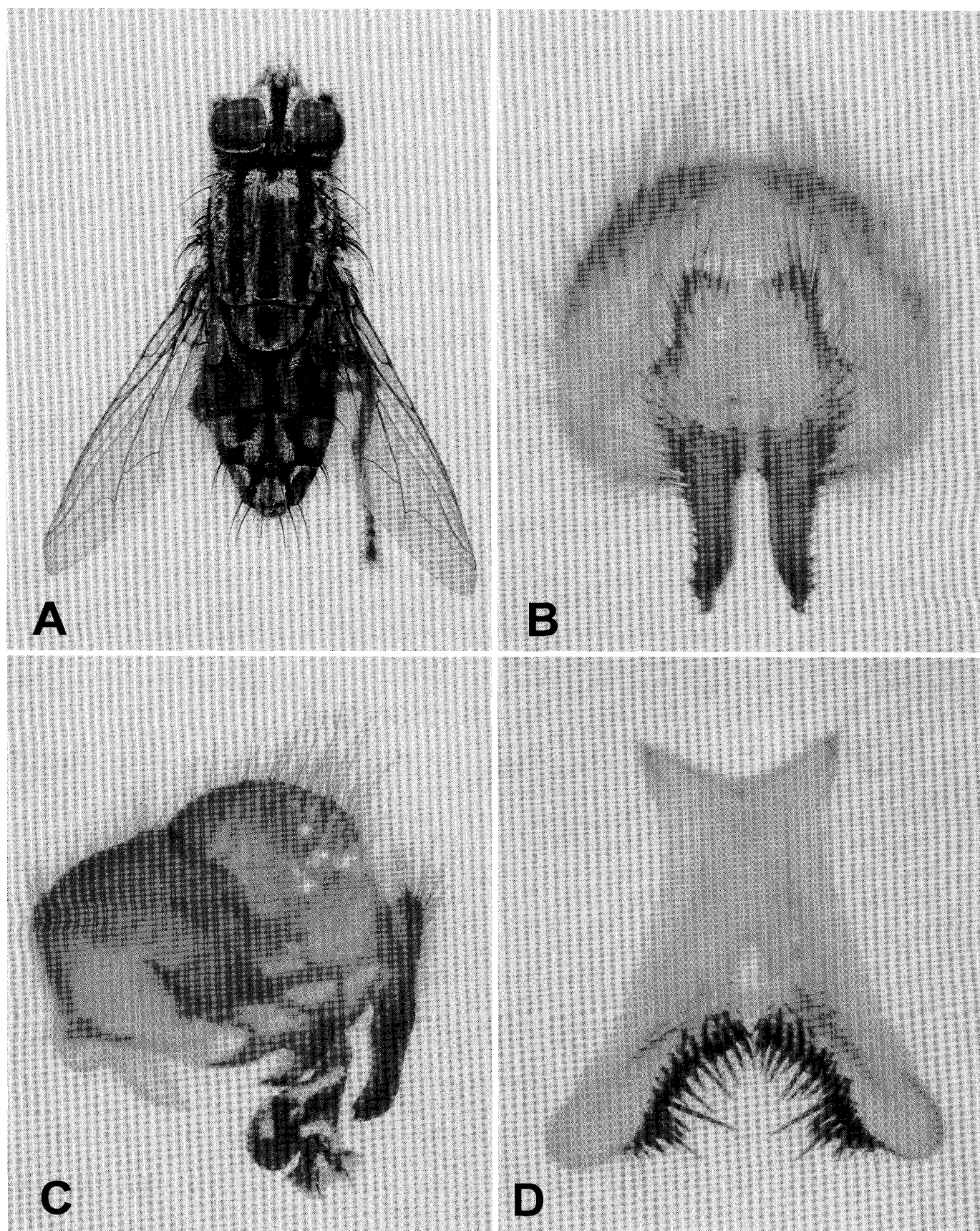


Fig. 1. *Boettcherisca highlandica* sp. nov., male and male copulatory apparatus.— A, habitus, dorsal view; B, hypopygium, caudal view; C, hypopygium, lateral view; D, sternite 5, ventral view.

epandrium (GS₂) reddish brown shining; GS₁ and GS₂ with numerous black hairs. Hypopygium: as shown in Fig. 2.

Female. — like male in general appearance except for broader frons, presence of proclinate fronto-orbital bristles (*ors*), and more robust abdomen. Frons index 0.26–0.27 (M=0.27, n=10). Ovipositor: short; tergite 6 of two sclerites, with row of marginal bristles (*mb*) divided on to two sclerites, hairy along posterior margin on less than 1/4 of total length; tergites 7–9 disappear; secondary pigmented area largely developed, quadrate in shape, appeared below tergite 6; sternite 6 of single plate, without incision, with complete row of *mb*, hairy along posterior margin on less than 1/4 of total length; sternite 7 of single plate, with incision, with 1–2 lateral *mb*, hairy on less than 1/4 of lateral lobe posteriorly..

Length: 10.0–12.0 mm.

Type material. Holotype: ♂ “Holotype [red card]//MALAYSIA: MALAYA/Pahang State,/Genting Highlands,/Gohtong Jaya,/nr forest, 6.v.2008/Coll. H. Kurahashi//Boettcherisca ♂/highlandica/sp. nov./Det. H. Kurahashi [red perimeter]”, NSMT-I-Dip6573, with a small tube containing dissected genitalia. Paratypes: with “Paratype [yellow card] and identification label [blue perimeter]; 3 ♂ 1 ♀, same data as holotype (NSMT); 7 ♂, Genting Highlands, 1,700 m, 20–21.iv.1979, H. Kurahashi (NSMT); 2 ♂ 1 ♀, Pahang State, Cameron Highlands, Tanah Rata, Mt. Jasar, montane forest, 2.v.2008, H. Kurahashi (SM); 65 ♂ 62 ♀, reared from larvae collected from Pahang State, Genting Highlands, Gohtong Jaya, nr forest, 6.v.2008, H. Kurahashi (IDD); 1 ♀, Selangor State, Gombak Dist., Gombak Utara, 32 km NNE of KL, forest, 5.v.2008, H. Kurahashi (IDD); 1 ♀, Gombak Dist., Gombak Utara, 29 km from Kuala Lumpur, 5.v.2008, H. Kurahashi (IDD); 3 ♂, Pahang State, Cameron Highlands Dist., Brinchang, Mt. Berembun, montane forest, 1.v.2008, S. H. Tan (UM); 3 ♂, Pahang State, Cameron Highlands Dist., Tanah Rata, Mt. Jasar, montane forest, 2.v.2008, S. H. Tan (UM); 1 ♂, Cameron Highlands, Tanah Rata, 1,300 m, 25.x.1991, R. Kano (NSMT); 1 ♂, Cameron Highlands, 16 ml from Tapah, 1,400 m, 28.x.1991, R. Kano and K. Inder Singh (NSMT).

Etymology. The specific epithet is named after the type locality “Genting Highlands”.

Type depository. Holotype and 13 paratypes are deposited in the National Science Museum, Tokyo. Fourteen paratypes separately in Sarawak Museum, Kuching; Bishop Museum, Honolulu; Natural History Museum, London; Carnegie Museum of History, Pittsburgh; Zoological Museum University of Copenhagen; Research Center for Biology-LIPI; University of Malaya, Kuala Lumpur; and Institute for Medical Research, Kuala Lumpur.

Remarks. The present new species is similar to *Boettcherisca krathonmai* Pape and Bänziger, 2000 from Thailand and Malaysia in general appearance (Pape and Bänziger, 2000, Figs. 4–5), but distinguished from the previous known species by the fuscous coloration of hairs on inner lower margin of alar squama and on outer lower margin of thoracic squama (Singh, 1979; Fan, 1992; Nandi, 2002). The length of pregonite (Fig. 2b) is longer than that of *B. krathonmai*.

Bionomics. *Boettcherisca highlandica* sp. nov. seems to be an inhabitant in the highlands of Peninsular Malaysia. Small numbers of male and female flies were collected in montane forests more than 1,200 m above sea level.

Distribution. Malaysia (Malaya).

Boettcherisca javanica Lopes, 1961

Boettcherisca javanica Lopes, 1961: 79. Type locality: Soekaboemie, Java [Indonesia].

Material examined. 9 ♂, Lubok Merbau, nr Kuala Kansar, 100 m, 17.iii.1990, H. Kurahashi

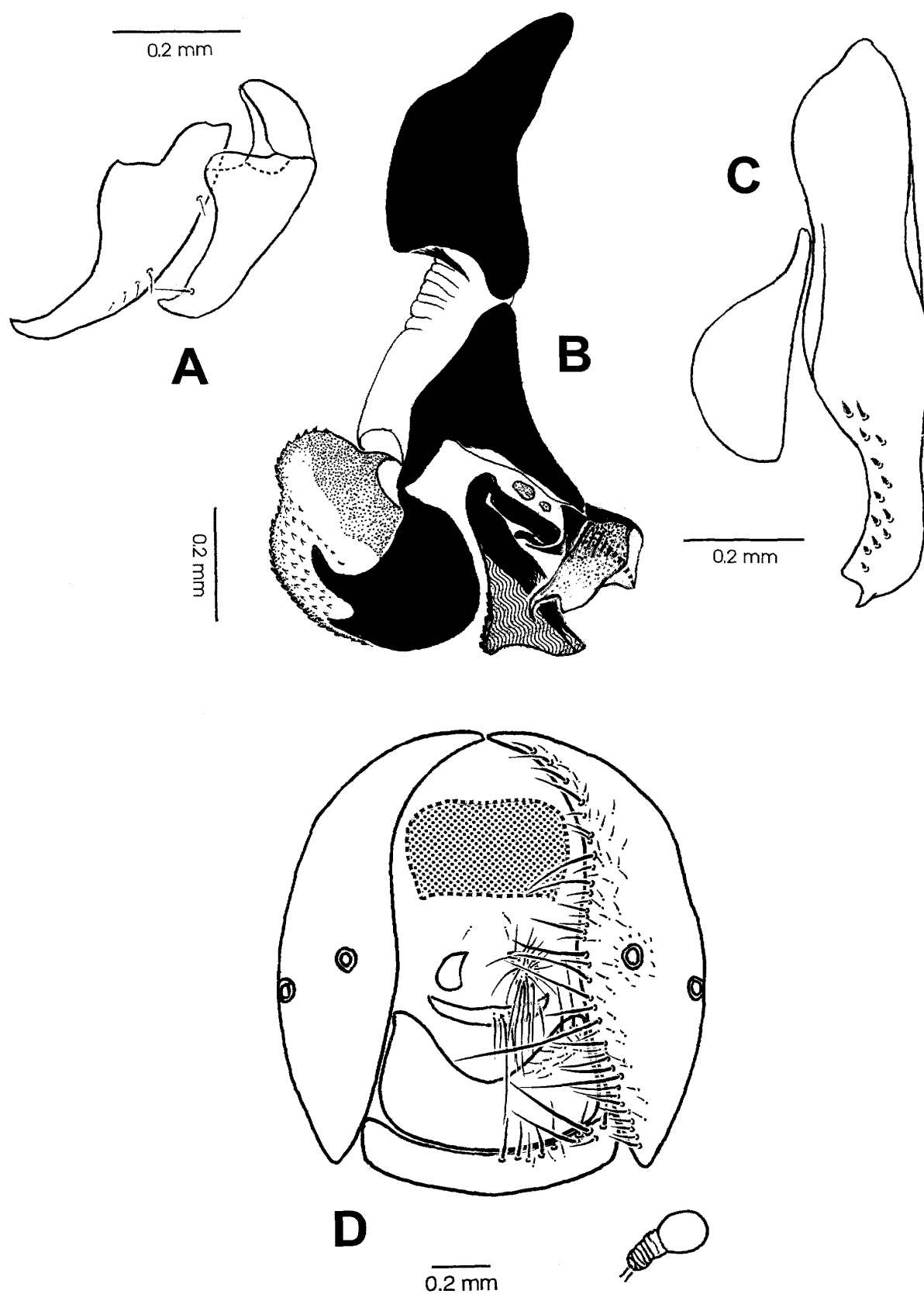


Fig. 2. *Boettcherisca highlandica* sp. nov., male and female genitalia. — A, pregonite and postgonite, lateral view; B, aedeagus, lateral view; C, surstylus and cercus, lateral view; D, ovipositor, caudal view.

(NIID); 1 ♂, Tapah Dist., 50 km from Tanah Rata, 1.v.2008, H. Kurahashi (IDD); 1 ♂, Genting Highlands, Gohtong Jaya, 6.v.2008, H. Kurahashi (IDD); 1 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 1 ♂, Johor State, Pontian District, Peradin River, swamp, 7.v.2008, S. H. Tan (UM); 1 ♂, Perak State, Taiping District, Matang Mangrove Forest Reserve, swamp, 3.v.2008, S. H. Tan (UM); 2 ♂, Perak State, Tapah District, 50 km from Tanah Rata, nr forest, 1.v.2008, S. H. Tan (UM).

***Boettcherisca karnyi* (Hardy, 1927)**

Sarcophaga karnyi Hardy, 1927: 454. Type locality: "Buitenzorg" [Bogor, Java, Indonesia]. Material examined. 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 1 ♀, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NSMT); 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 1 ♀, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NSMT); 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 5 ♀, Pontian Dist., Peradin River, 7.v.2008, H. Kurahashi (IDD); 13 ♂, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD) [9 ♂ > SM(gift)]; 10 ♂ 4 ♀, Taiping Dist., Matang Mangrove Forest Reserve, 3.v.2008, H. Kurahashi (IDD). 8 ♂, Johor State, Pontian District, Peradin River, swamp, 7.v.2008, S. H. Tan (UM); 6 ♂, Johor State, Pontian District, Tanjung Piai N.P., swamp, 7.v.2008, S. H. Tan (UM); 8 ♂, Perak State, Taiping District, 3 km from Kuala Sepetang, swamp, 3.v.2008, S. H. Tan (UM); 5 ♂, Perak State, Taiping District, Matang Mangrove Forest Reserve, swamp, 3.v.2008, S. H. Tan (UM).

***Boettcherisca krathonmai* (Pape and Bänziger, 2000)**

Sarcophaga (Boettcherisca) krathonmai Pape and Bänziger, 2000: 204. Type locality: Khlong Naka Wildlife Sanctuary, Phya Nak Falls, Ranong Province, Thailand. Material examined. 1 ♂, Taman Negara, K. Tahan, 60 m, 22–26.iv.1979, H. Kurahashi (NSMT); 12 ♂ 3 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 1 ♂, Gombak Dist., Gombak Utara, 29 km from Kuala Lumpur, 5.v.2008, H. Kurahashi (IDD); 4 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD).

***Boettcherisca peregrina* (Robineau-Desvoidy, 1830)**

Myophora peregrina Robineau-Desvoidy, 1830: 356. Type locality: Port Jackson nr Sydney, New South Wales, Australia. Material examined. 2 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NIID); 2 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NSMT); 1 ♂, Tanjung Sepat, 3–16.viii.2007, H. C. Chin (PCHCC).

***Harpagophalla kempii* (Senior-White, 1924)**

Sarcophaga kempii Senior-White, 1924: 247. Type locality: Matale, Sri Lanka. Material examined. 1 ♂, Tembellong, 50 m, 20.v.1979, S. Asahina (NSMT).

****Iranihindia martellata* (Senior-White, 1924)**

Sarcophaga martellata Senior-White, 1924: 247. Type locality: Niroddumunai, Sri Lanka. Material examined. 2 ♂ 1 ♀, Kuala Lumpur, Old Klang Road, Taman Abadi Indah, 11.viii.2007, S. H. Tan (UM); 2 ♂, University of Malaya, 26.viii.2006, S. H. Tan (UM); 2 ♂,

University of Malaya, 26.viii.2006, S. H. Tan (UM); 2 ♀, Kuala Lumpur, UM, Botanical Garden, 24–25.xi.2007, S. H. Tan (IDD); 2♂ 1 ♀, Kuala Lumpur, Old Klang Road, Taman Abadi Indah, 11.viii.2007, S. H. Tan (UM); 1 ♂, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 1 ♀, Kuala Lumpur, UM, Genetics, 4.viii.2006, S. H. Tan (UM); 1 ♂, Negeri Sembilan State, Port Dickson District, Port Dickson, nr sandy beach, 8.v.2008, S. H. Tan (UM).

***Leucomyia alba* (Schiner, 1868)**

Sarcophila alba Schiner, 1868: 315. Type locality: Sri Lanka.

Material examined. 1 ♂, Penang, Pantai Kerachut, 11.xii.1975, S. P. Goh (NSMT); 17 ♂ 6 ♀, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 10 ♂, 7 ♀, Negeri Sembilan State, Port Dickson District, Port Dickson, nr sandy beach, 8.v.2008, S. H. Tan (UM).

***Lioproctia pattoni* (Senior-White, 1924)**

Sarcophaga pattoni Senior-White, 1924: 242. Type locality: Coonoor, Nilgiri Hills, Tamil Nadu, India.

Material examined. 1 ♂, Padang Rengas nr Taiping, 50 m, 17.iii.1990, H. Kurahashi (NIID); 1 ♀, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 1 ♂, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT).

****Lioproctia saprianovae* (Pape and Bänziger, 2000)**

Sarcophaga (Lioproctia) saprianovae Pape and Bänziger, 2000: 202. Type locality: Khlong Naka Wildlife Sanctuary, Phya Nak Falls, Ranong Province, Thailand.

Material examined. 3 ♂ 3 ♀, Taman Negara, K. Tahan, 60 m, 22–26.iv.1979, H. Kurahashi (NIID); 23 ♂ 12 ♀, Fraser's Hill, Jerian W. Fall, 18–20.iv.1979, H. Kurahashi (NIID); 1 ♂, Endau-Mersing, 6.iv.1982, Bahar (NIID); 1 ♀, Genting Highlands, Gohtong Jaya, 6.v.2008, H. Kurahashi (IDD).

***Lioproctia urceola* (Shinonaga and Beaver, 1970)**

Pierretia urceola Shinonaga and Beaver, 1979: 37. Type locality: Telok Bahang, Pinang, West Malaysia, Malaysia.

Material examined. 3 ♀, Cameron Highland, Mt. Jasar, 2,100 m, 26.x.1991, R. Kano and K. Inder Singh (NSMT); 2 ♂, Cameron Highland, Mt. Beringchang, 2,110 m, 27.x.1991, R. Kano and K. Inder Singh (NSMT).

***Liopygia ruficornis* (Fabricius, 1794)**

Musca ruficornis Fabricius, 1794: 314. Type locality: "India orientali" [SE Asia].

Material examined. 2 ♂, Kuala Lumpur, Sri Subamanya Swamy Temple, 29.x.1991, R. Kano and K. Inder Singh (NSMT); 1 ♀, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NSMT); 2 ♂, ?, 16.ix.1991, J. Jeffery (PCHCC).

***Myorhina globovesica* (Ye, 1980)**

Pierretia globovesica Ye, 1980: 411. Type locality: Miyi, Sichuan, China.

Material examined. 2 ♂, Cameron Highland, Mt. Jasar, 2,100 m, 26.x.1991, R. Kano and

K. Inder Singh (NSMT).

***Myorhina borneensis* (Shinonaga and Lopes, 1975)**

Thyrsocnema (*Pseudothyrsocnema*) *borneensis* Shinonaga and Lopes, 1975: 463. Type locality: 19 km N Kalabakan, Tawau District, Sabah, Malaysia.

Material examined. 1 ♂, Cameron Highlands Dist., 19 miles from Tapah, 1.v.2008, H. Kurahashi (IDD); 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 1 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 1 ♂, Pahang State, Cameron Highlands District, 19 miles from Tapah, nr forest, 1.v.2008, S. H. Tan (UM).

***Parasarcophaga albiceps* (Meigen, 1826)**

Sarcophaga albiceps Meigen, 1826: 22. Type locality: Europe [probably Germany].

Material examined. 2 ♂, Lubok Merbau, nr Kuala Kansar, 100 m, 17.iii.1990, H. Kurahashi (NSMT); 2 ♂, Frasar's Hill, Jerian W. fall, 18–20.iv.1979, H. Kurahashi (NSMT); 2 ♂ 3 ♀, Cameron Higland, 7 ml from Tapah, 100 m, 28.x.1991, R. Kano and K. Inder Singh (NSMT); 2 ♂, Penang, Botanical Gardens, 26.xii.1975, S. P. Goh (NSMT); 1 ♂, Cameron Higland, Tanah Rata, 1,300 m, 25.x.1991, R. Kano (NSMT); 2 ♂, Taman Negara, K. Tahan, 60 m, 22–26.iv.1979, H. Kurahashi (NSMT); 1 ♂, Bukit Larut, 800 m, 18.iii.1990, H. Kurahashi (NSMT); 1 ♂, Aya Itam Dam, 25.xii.1975, S. P. Goh (NSMT); 1 ♂, Cameron Higland, 16 ml from Tapah, 400 m, 28.x.1991, R. Kano and K. Inder Singh (NSMT); 1 ♂, Cameron Higland, Mt. Jasar, 2,100 m, 26.x.1991, R. Kano and K. Inder Singh (NSMT); 2 ♂, Matang Mangrove Forest Reserve, 3.v.2008, H. Kurahashi (IDD); 1 ♂, Genting Highlands, Gohtong Jaya, 6.v.2008, H. Kurahashi (IDD); 1 ♂, Cameron Highlands, Dist., 19 miles from Tapah, 1.v.2008, H. Kurahashi (IDD); 1 ♂, Cameron Highlands, Dist., Tanah Rata, Mt. Jasar, 2.v.2008, H. Kurahashi (IDD); 1 ♂, Gombak Dist., Gombak Utara, 29 km from Kuala Lumpur, 5.v.2008, H. Kurahashi (IDD); 2 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 5 ♂, Pahang State, Cameron Highlands District, 19 miles from Tapah, nr forest, 1.v.2008, S. H. Tan (UM); 1 ♂, Pahang State, Cameron Highlands District, Brinchang, Mt. Berembun, montane forest, 1.v.2008, S. H. Tan (UM); 3 ♂, Pahang State, Cameron Highlands District, Tanah Rata, Mt. Jasar, montane forest, 1.v.2008, S. H. Tan (UM); 18 ♂, Selangor State, Gombak District, Gombak Utara, 29 km from Kuala Lumpur, nr forest, 5.v.2008, S. H. Tan (UM).

***Parasarcophaga brachiata* (Sugiyama, 1990)**

Sarcophaga brachiata Sugiyama, 1990: 84. Type locality: Sentosa I., Singapore.

Material examined. 4 ♂, Pontian Dist., Peradin River, 7.v.2008, H. Kurahashi (IDD); 1 ♂, Johor State, Pontian District, Tanjung Piai N.P., swamp, 7.v.2008, S. H. Tan (UM).

***Parasarcophaga brevicornis* (Ho, 1934)**

Sarcophaga brevicornis Ho, 1934: 23. Type locality: Beijing, China.

Material examined. 3 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NSMT); 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂, Bukit Lanjan, 20.iv.1987, J. Jeffery (PCHCC)

***Parasarcophaga dux* (Thomson, 1869)**

Sarcophaga dux Thomson, 1869: 534. Type locality: Oahu, Hawaiian Is.

Material examined. 1 ♀, Cameron Highland, 7 ml from Tapah, 100 m, 28.x.1991, R. Kano and K. Inder Singh (NSMT); 4 ♂ 1 ♀, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 11 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NIID); 1 ♂, Taiping Dist., Matang Mangrove Forest Reserve, 3.v.2008, H. Kurahashi (IDD); 2 ♂, Zoo Negara, ?, J. Jeffery (PCHCC); 1 ♂, Pontian Dist., Peradin River, 7.v.2008, H. Kurahashi (IDD); 7 ♂, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 4 ♂, Negeri Sembilan State, Port Dickson District, Port Dickson, nr swamp, 8.v.2008, S. H. Tan (UM); 2 ♂, Negeri Sembilan State, Port Dickson District, Port Dickson, nr sandy beach, 8.v.2008, S. H. Tan (UM).

***Parasarcophaga javana* (Macquart, 1851)**

Sarcophaga javana Macquart, 1851: 205. Type locality: Java, Indonesia.

Material examined. 1 ♂, Cameron Highlands, Dist., Tanah Rata, Mt. Jasar, 2.v.2008, H. Kurahashi (IDD); 1 ♂, Pahang State, Cameron Highlands District, Brinchang, Mt. Berembun, montane forest, 1.v.2008, S. H. Tan (UM); 4 ♂, Pahang State, Cameron Highlands District, Tanah Rata, Mt. Jasar, montane forest, 2.v.2008, S. H. Tan (UM).

***Parasarcophaga lopesi* Verves, 1980**

Parasarcophaga (Baliisca) lopesi Verves, 1980: 39. Type locality: Sendeh nr Danpassar, Bali, Indonesia.

Material examined. 6 ♂ 4 ♀, Klang, 0 m, 23.x.1991, R. Kano (NSMT).

***Parasarcophaga mimobrevicornis* (Sugiyama, 1990)**

Sarcophaga mimobrevicornis Sugiyama, 1990: 86. Type locality: 20 km W Kuala Lumpur, West Malaysia, Malaysia.

Material examined. 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂, Kuala Serangor, 31.x.1975, S. Shinonaga (NSMT); 1 ♂, Matang Mangrove Forest Reserve, 3.v.2008, H. Kurahashi (IDD); 1 ♂, Pontian Dist., Peradin River, 7.v.2008, H. Kurahashi (IDD); 2 ♂, Johor State, Pontian District, Tanjung Piai N.P., swamp, 7.v.2008, S. H. Tan (UM); 2 ♂, Perak State, Taiping District, Matang Mangrove Forest Reserve, swamp, 3.v.2008, S. H. Tan (UM).

***Parasarcophaga misera* (Walker, 1849)**

Sarcophaga misera Walker, 1849: 829. Type locality: "New Holland" [Australia].

Material examined. 2 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NSMT); 2 ♂, Fraser's Hill, Jerian W. Fall, 18–20.iv.1979, H. Kurahashi (NSMT); 1 ♂, Bukit Larut, 800 m, 18.iii.1990, H. Kurahashi (NSMT); 2 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂, Matang Mangrove Forest Reserve, 3.v.2008, H. Kurahashi (IDD); 1 ♂ 3 ♀, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 2 ♂ 1 ♀, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 1 ♂, Bukit Lanjan, 20.iv.1987, J. Jeffery (PCHCC); 1 ♀, Tanjung Sepat, 3–16.viii.2007, H. C. Chin (PCHCC); 1 ♂, Gombak Dist., Gombak Utara, 29 km from Kuala Lumpur, 5.v.2008, H. Kurahashi (IDD); 1 ♂, Negeri Sembilan State, Port Dickson District, Port Dickson, nr sandy beach, 8.v.2008, S. H. Tan (UM); 1 ♂, Pahang State, Cameron Highlands District, 19 miles from Tapah, nr forest, 1.v.2008, S. H. Tan (UM); 2 ♂, Perak State, Taiping District, 3 km from Kuala Sepetang, swamp, 3.v.2008, S. H. Tan (UM); 4 ♂, Selangor State, Gombak District, Gombak Utara, 29 km from Kuala Lumpur, nr forest, 5.v.2008, S. H. Tan (UM).

***Parasarcophaga omari* Kurahashi and Leh, 2007**

Parasarcophaga omari Kurahashi and Leh, 2007: 269. Type locality: Kampung Tarat, Mt. Sedong, nr Serian, Sarawak, Malaysia.

Material examined. 1 ♂, Gombak Dist., Gombak Utara, 29 km from Kuala Lumpur, 5.v.2008, H. Kurahashi (IDD).

***Parasarcophaga robustispinosa* (Sugiyama, 1990)**

Sarcophaga robustispinosa Sugiyama, 1990: 89. Type locality: Sentosa I., Singapore.

Material examined. 3 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂, Taiping Dist., 3 km from Kuala Sepetang, 3.v.2008, H. Kurahashi (IDD); 1 ♂, Pontian Dist., Peradin River, 7.v.2008, H. Kurahashi (IDD); 3 ♂, Taiping Dist., Matang Mangrove Forest Reserve, 3.v.2008, H. Kurahashi (IDD); 4 ♂, Johor State, Pontian District, Peradin River, swamp, 7.v.2008, S. H. Tan (UM); 1 ♂, Perak State, Taiping District, 3 km from Kuala Sepetang, swamp, 3.v.2008, S. H. Tan (UM).

***Parasarcophaga scopariiformis* (Senior-White, 1927)**

Sarcophaga dux ssp. *scopariiformis* Senior-White, 1927: 82. Type locality: Suduganga, Matale, Sri Lanka.

Material examined. 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂, Matang Mangrove Forest Reserve, 3.v.2008, H. Kurahashi (IDD); 1 ♂, Perak State, Taiping District, Matang Mangrove Forest Reserve, swamp, 3.v.2008, S. H. Tan (UM).

***Parasarcophaga taenionota* (Wiedemann, 1819)**

Musca taenionota Wiedemann, 1819: 22. Type locality: "Bavaria" [Jakarta], Java, Indonesia.

Material examined. 1 ♂, Taman Negara, K. Tahan, 60 m, 22–26.iv.1979, H. Kurahashi (NSMT); 1 ♂, Frasar's Hill, 1,300 m, 18–20.iv.1979, H. Kurahashi (NSMT); 1 ♂, Fraser's Hill, 1,300 m, 18–20.iv.1979, H. Kurahashi (NSMT); 3 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂ 1 ♀, Tanjung Sepat, 3–16.viii.2007, H. C. Chin (PCHCC); 2 ♂, 16 ml. Ulu Gombak, 26.viii.2002, J. Jeffery (PCHCC); 1 ♀, Zoo Negara, 1.iv.1999, J. Jeffery (PCHCC); 1 ♂, Bukit Lanjan, 20.iv.1987, J. Jeffery (PCHCC); 1 ♂, Cameron Highlands, Dist., Tanah Rata, Mt. Jasar, 2.v.2008, H. Kurahashi (IDD); 1 ♂, Pontian Dist., Peradin River, 7.v.2008, H. Kurahashi (IDD); 3 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 2 ♂, Johor State, Pontian District, Peradin River, swamp, 7.v.2008, S. H. Tan (UM); 1 ♂, Pahang State, Cameron Highlands District, 19 miles from Tapah, nr forest, 1.v.2008, S. H. Tan (UM); 1 ♂, Pahang State, Cameron Highlands District, Tanah Rata, Mt. Jasar, montane forest, 2.v.2008, S. H. Tan (UM); 4 ♂, Perak State, Taiping District, 3 km from Kuala Sepetang, swamp, 3.v.2008, S. H. Tan (UM); 1 ♂, Perak State, Taiping District, Matang Mangrove Forest Reserve, swamp, 3.v.2008, S. H. Tan (UM); 5 ♂, Selangor State, Gombak District, Gombak Utara, 29 km from Kuala Lumpur, nr forest, 5.v.2008, S. H. Tan (UM).

***Parasarcophaga yunnanensis* Fan, 1964**

Parasarcophaga (Curranella) yunnanensis Fan, 1964: 308. Type locality: Men-ah, Shishong-Baanna, Yunnan, China.

Material examined. 2 ♂, Taman Negara, K. Tahan, 60 m, 22–26.iv.1979, H. Kurahashi (NSMT).

***Rosellea notabilis* (Kano and Lopes, 1969) com. nov.**

Burmanomyia notabilis Kano and Lopes, 1969: 521. Type locality: Ulu Langat, Selangor, Malaysia.

Material examined. 6 ♂, Taman Negara, Kuala Tahan, 60 m, 22–26.iv.1979, H. Kurahashi (NIID); 1 ♂, Cameron Highland, 16 ml from Tapah, 400 m, 28.x.1991, R. Kano and K. Inder Singh (NSMT); 1 ♀, Bukit Mandul, 20 km W. K. L., 1.xi.1975, H. Shima (NIID); 1 ♂, Ulogombach rd., 80 km E. K. L., 30.x.1975, S. Shinonaga (NIID); 1 ♀, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 3♂ 3♀, Genting Highlands, Gohtong Jaya, 6.v.2008, H. Kurahashi (IDD).

***Sarcophaga* (s.l.) *aquila* (Sugiyama, 1990)**

Sarcophaga (s.l.) *aquila* Sugiyama, 1990: 82. Type locality: Sentosa Is., Singapore.

Material examined. 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 3 ♂, Johor State, Pontian District, Peradin River, swamp, 7.v.2008, S. H. Tan (UM).

***Sarcophaga* (s.l.) *longifilia* (Salem, 1946)**

Sarcophaga (s.l.) *longifilia* Salem, 1946: 189. Type locality: Christmas I. [Indian Ocean].

Material examined. 1 ♂, Klang, 0 m, 23.x.1991, R. Kano (NSMT); 1 ♂, Johor State, Pontian District, Tanjung Piai N.P., swamp, 7.v.2008, S. H. Tan (UM).

***Sarcorohdendorfia inextricata* (Walker, 1859)**

Sarcophaga inextricata Walker, 1859: 132. Type locality: Ujung Pandang, Sulawesi, Indonesia.

Material examined. 2 ♂, Penang, Ayer Itam Dam, 13.xii.1975, S. P. Goh (NSMT); 1 ♀, Gombak Dist., Gombak Utara, 29 km from Kuala Lumpur, 5.v.2008, H. Kurahashi (IDD); 2 ♂ 3 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 1 ♂ 1 ♀, 16 ml. Ulu Gombak, 7.viii.2002, J. Jeffery (PCHCC); 1 ♂, Selangor State, Gombak District, Gombak Utara, 29 km from Kuala Lumpur, nr forest, 5.v.2008, S. H. Tan (UM).

***Sarcosolomonina crinita* (Parker, 1917)**

Sarcophaga crinita Parker, 1917: 92. Type locality: Philippines.

Material examined. 3 ♂ 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 13 ♂, Lubok Merbau, nr Kuala Kansar, 100 m, 17.iii.1990, H. Kurahashi (NIID); 1 ♂, Tapah Dist., 50 km from Tanah Rata, 1.v.2008, H. Kurahashi (IDD); 3 ♂ 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 2 ♂ 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 1 ♀, Pontian Dist., Peradin River, 7.v.2008, H. Kurahashi (IDD); 4 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 3 ♂ 1 ♀, Cameron Highlands Dist., 19 miles from Tapah, 1.v.2008, H. Kurahashi (IDD); 1 ♂, Gombak Dist., Gombak Utara, 29 km from Kuala Lumpur, 5.v.2008, H. Kurahashi (IDD); 1 ♂, Pahang State, Cameron Highlands District, 19 miles from Tapah, nr forest, 1.v.2008, S. H. Tan (UM); 7 ♂, Perak State, Tapah District, 50 km from Tanah Rata, nr forest, 1.v.2008, S. H. Tan (UM); 1 ♂, Selangor State, Gombak District, Gombak Utara, 29 km from Kuala

Lumpur, nr forest, 5.v.2008, S. H. Tan (UM).

***Sarcosolomonina rohdendorfi* Nandi, 1976**

Sarcosolomonina (Parkerimyia) rohdendorfi Nandi, 1976: 12. Type locality: Hijli Forest, 24-Parganas, West Bengal, India.

Material examined. 2 ♂, Lubok Merbaau, nr Kuala Kansar, 100 m, 17.iii.1990, H. Kurahashi (NIID).

***Seniorwhitea princeps* (Wiedemann, 1830)**

Sarcophaga princeps Wiedemann, 1830: 359. Type locality: Sumatra, Indonesia.

Material examined. 1 ♂, Fraser's Hill, Jerian W. Fall, 18–20.iv.1979, H. Kurahashi (NSMT); 1 ♂, Ulu Gombak, ?viii.1999, F. Ito (NIID); 1 ♂, Tembeling, 50 m, 20.v.1979, S. Asahina (NSMT); 2 ♂, Bukit Larut, 800 m, 18.iii.1990, H. Kurahashi (NSMT); 1 ♂, Padang Rengas nr Taiping, 50 m, 17.iii.1990, H. Kurahashi (NSMT); 1 ♂, Lubok Merbau nr Kuala Kansar, 100 m, 17.iii.1990, H. Kurahashi (NSMT); 1 ♂, Gombak, 22.ii.2008, C. D. Chen (PCHCC); 2 ♂ 1 ♀, Tanjung Sepat, 3–16.viii.2007, H. C. Chin (PCHCC); 1 ♂ 1 ♀, Tapah Dist., 50 km from Tanah Rata, 1.v.2008, H. Kurahashi (IDD); 1 ♂, Genting Highlands, Gohtong Jaya, 6.v.2008, H. Kurahashi (IDD); 1 ♂, Gombak Dist., Gombak Utara, 32 km NNE of KL, 5.v.2008, H. Kurahashi (IDD); 1 ♀, Ulu Gombak, 16–23.ix.2004, H. Kurahashi (NSMT); 1 ♂, Port Dickson Dist., Port Dickson, 8.v.2008, H. Kurahashi (IDD); 3 ♂, Selangor State, Gombak District, Gombak Utara, 29 km from Kuala Lumpur, nr forest, 5.v.2008, S. H. Tan (UM).

***Sinonipponia hainanensis* (Ho, 1934)**

Sarcophaga hainanensis Ho, 1936: 210. Type locality: Nam-ting, Hainan, China.

Material examined. 1 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NIID).

***Sinonipponia hervebazini* (Séguy, 1934)**

Sarcophaga hervebazini Séguy, 1934: 26. Type locality: Zi-ka-wei, Shanghai, China.

Material examined. 1 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NIID); 3 ♂, Kuala Kangsar, 50 m, 16.iii.1990, H. Kurahashi (NIID).

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REFERENCES

- Fan, Z. 1992. Key to the Common Flies of China, 2nd edition. xlviii+992+40pls., Academia Sinica, Beijing.
- Kurahashi, H. 1996. The first endemic *Macronychia* from the Oriental Region (Dipter: Sarcophagidae). *Jpn. J. Ent.*, **64**: 267-274.
- Nandi, B. C. 2002. The Fauna of India and the Adjacent Countries, Diptera, Vol. X, Sarcophagidae. xiii+288 pp., Zoological Survey of India, Kolkata.
- Pape, T. and Bänziger, H. 2000. Two new species of *Sarcophaga* (Diptera: Sarcophagidae) among pollinators of newly discovered *Sapria ram* (Rafflesiaceae). *Raffles Bull. Zool.*, **48**: 201-208.
- Singh, K. I., Kurahashi, H. and Kano, R. 1979. A preliminary key to the common calliphorid flies of Peninsular Malaysia (Insecta: Diptera). *Bull. Tokyo Med. Dent. Univ.*, **26**: 5-24.
- Shinonaga, S. and Beaver, R. A. 1979. *Pierretia urceola*: a new species of sarcophagid fly found living in *Nepenthes* pitcher plants in West Malaysia. *Annls Soc. Ent. Fr.* (n. s.), **15**: 37-40.
- Sugiyama, E., Shinonaga, S. and Kano, R. 1990. Two new species and six new records of sarcophagine flies from the Philippines (Diptera, Sarcophagidae). *Jpn. J. Sanit. Zool.*, **41**: 93-97.